DOCUMENT RESUME

ED 101 528 EC 071 317

AUTHOR Ferneti, Casper L.; And Others
TITLE The Direction Following Behavior of Mentally Retarded Adolescents as a Function of Verbal Rehearsal. Working Paper No. 283.
INSTITUTION Parsons State Hospital and Training Center, Kans.
PUB DATE Jan 73
NOTE 32p.; For related information see EC 071 314

EDRS PRICE MF-$0.76 HC-$1.95 PLUS POSTAGE
DESCRIPTORS Adolescents; Exceptional Child Research; Learning Characteristics; Listening Comprehension; Mentally Handicapped; *Receptive Language; Retention; *Teaching Methods; *Trainable Mentally Handicapped; Verbal Learning
IDENTIFIERS Directions; *Project MORE

ABSTRACT

Assessed were the effects of verbal placeholding and full verbal rehearsal (verbalizing aloud the critical components and sequence) on the direction following behavior of 14 institutionalized retarded adolescents (mean IQ 48). A control group from the same institution participated in practice sessions without the verbal rehearsal stress. Pre- and posttest measures of correctly followed and sequenced directives indicated that both practice and rehearsal strategies facilitate direction following performance. Three appendixes provided details of testing situations. (CL)

ED101528

U.S. DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY.

PARSONS RESEARCH CENTER

Working Paper # 283

January 1973

THE DIRECTION FOLLOWING BEHAVIOR OF MENTALLY RETARDED ADOLESCENTS AS A FUNCTION OF VERBAL REHEARSAL

Casper L. Ferneti, Jennifer F. Holvoet,
Dennis J. Tucker, James R Lent,
Ingo Keilitz

This research was performed pursuant to Grant No. 5 PO1 NICH-HD-00870 with the National Institute of Child Health and Human Development. Points of view or opinions stated do not necessarily represent official HEW position or policy.

Those working papers are intended primarily as informal research communications to and among members of the Research staff. They may contain hypotheses, study proposals, reports of a study, critiques, etc., at any stage of refinement. Persons outside the Research staff are free to contribute to the series but distribution outside the Research staff is at the discretion of the authors.

BEST COPY AVAILABLE

Introduction

Following directions is a critical adaptive skill which has functional value in a variety of settings. Sokolove and Girardeau (1972) surveyed eleven employers of retarded individuals and reported that 100 percent of the employers they interviewed considered direction following an important skill. The retarded, however, do not follow directions as well as nonretarded individuals (Lent, Holvoet, Ferneti, Kolitz, and Tucker, 1972).

Attempts to ameliorate direction following deficits in the retarded have not been reported in the literature. Therefore, since direction following necessarily involves the processing of input information over short periods of time, research on the short-term memory of mentally retarded individuals seems directly related to the problem of direction following for the retarded.

It has been suggested that the short-term memory of the mentally retarded is deficient in at least two aspects: 1) the manner in which they acquire or store information, and 2) the manner in which they retrieve information from their memory stores (Butterfield, Wambold, and Belmont, 1972). Surprisingly, retention does not seem to be responsible for recall deficits in the retarded since the retarded and nonretarded alike demonstrate equal forgetting (Belmont and Butterfield, 1969; Belmont, in press). Belmont and Butterfield (1969; 1971a) have identified both active and passive components of information acquisition and have shown that these are associated with differential recall. This suggests two memory systems which differ in the manner in which information is acquired, retained, and retrieved. These two memory systems appear to be similar to the primary and secondary memories identified by others (Waugh and Norman, 1965; Ellis, 1970). The primary system consists of passive acquisition, short retention, and quick retrieval. In contrast, the secondary system is characterized by acquisition through active rehearsal, long retention, and systematic time consuming retrieval.

BEST COPY AVAILABLE

research indicates that retarded and nonretarded children and adults are somewhat comparable in the manner in which they use their primary systems. The retarded, however, presumably do not use their secondary systems nearly as well as the nonretarded (Belmont and Butterfield, 1969; 1971a; 1971b; Ellis, 1970). Belmont and Butterfield (1969) further state that the principle reason retardates are inferior to normal adults in short-term memory functioning is that the retardates use fewer active acquisition strategies. Kellas (1972) reports that third and fifth graders rehearse aloud in the same fashion as when they rehearse silently. Seventh graders, however, show differences in silent and vocal rehearsal indicating that their rehearsal activity cannot be successfully externalized. It may be that retarded and younger nonretarded individuals of comparable mental age (MA) rehearse aloud or silently in the same fashion.

The purpose of this study was to assess the effects of verbal placeholding and full verbal rehearsal (numbering aloud the position of a directive in a directive set and verbalizing aloud the critical components of each directive in the set, such as, *one, show me two combs; two, find (the) hammer*) on the direction following performance of retarded individuals.

Method

Subjects

The 26 subjects who participated in this study were residents of the Parsons State Hospital and Training Center in Parsons, Kansas. The subjects ranged in chronological age (CA) from 14.1 to 17.1 years (mean CA = 16.4 years). Their WISC or WAIS Full Scale IQ scores ranged from 40 to 58 (mean IQ = 48.1). This data includes prorating of WISC Full Scale scores into IQ's following Ogden (1960).

Materials

The stimulus materials consisted of 1360 directives in sentence form distributed into six sets, 154 common objects, and a bookshelf. The bookshelf, containing 140 objects, was constructed with five shelves of varying depths permitting

BEST COPY AVAILABLE

visibility of objects on the shelves (see Appendix A). Only the second, , and fourth shelves were used to hold objects. Numbered locations on the llowed for the consistency and facilitation of object placement on all (see Appendix B).

of 1360 imperative sentences were constructed from a list of 154 erbs, 14 adjectives, and 11 prepositions (see Appendix C). Each of nces, in all phases except the screening phase, had one of three basic nes:

a) verb + noun phrase + prepositional phrase;
b) verb + two noun phrases; or
c) verb + prepositional phrase.

The 1360 sentences generated were then distributed into sets: one or more sentences (directives) were presented serially to the subject as a complex stimulus unit prior to the attempt at direction following. For the pretest for training and four baselines, 125 different objects and 490 different directives in sentence form were arranged into 225 sets containing 1, 2, 3, 4, and 5 separate sentences. In each session, 20, 10, 6, 5, and 4 presentations were used respectively. Materials for the pretest and posttest for generalization consisted of different objects and directives than those used for pretest and posttest training. The 29 objects and directives in sentence form were arranged into 45 sets containing 1, 2, 3, 4, and 5 separate sentences; 20, 10, 6, 5, and 4 presentations were used respectively. The 15 training units consisted of the directives in sentence form and the 125 objects employed in the pretest for training and baseline. The sentences, however, which consisted of 870 directives, were arranged into 105 sets containing 2, 3, and sentences; 10, 6, and 5 presentations were used respectively.

Sc

ty moderately retarded adolescents were initially screened to ensure correct re of all nouns, verbs, adjectives, and prepositions listed in Appendix C. Subjects who failed a test item were informed of the correct response. If a subject

BEST COPY AVAILABLE

the same item on three consecutive trials the subject was dropped. The subject reached criterion when every item was responded to correctly on two consecutive trials. Subjects were given one token for every five correct responses. At the end of a session, the tokens were exchanged for pennies at the rate of ten tokens per penny. Twenty-seven subjects met criterion and were randomly assigned to one of two treatment groups.

A training pretest and a generalization pretest were administered to all subjects individually in the presence of two experimenters: 1) an interacting experimenter (*IE*) and 2) a non-interacting experimenter (*NE*). Both experimenters simultaneously, but independently, recorded data for each subject; however, only the *IE* interacted verbally with the subjects.

As each subject entered the experimental room, he or she was greeted by the *IE* who said:

> *I am your teacher and he (pointing to NE) is your other teacher. We're going to play a game. I want you to sit in your chair while I ask you to do some things. Then, you do what I tell you in the right order. Do the best you can. Listen carefully.*

Immediately following this introduction, each subject was instructed to respond to a directive set containing two imperative sentences. This set served as an exemplar and was not recorded. If the set was performed appropriately the *IE* proceeded with the experimental session. If the subject erred in the performance of the example, the *IE* repeated the sample directives, provided the subject with feedback concerning the appropriateness of his responses, and proceeded with the first experimental set if the subject's behavior was appropriate. If the subject erred once again, the *NE* modeled the desired behavior and the *IE* asked the subject to attempt following the sample directive once again. Regardless of the appropriateness of this final exemplar the *IE* proceeded to present the first experimental directive.

BEST COPY AVAILABLE

Directives were presented orally by the *IE* to each subject. Each presentation of a set was preceded by the *IE* saying, *This time I'm going to ask you to do n things.* The number of separate directives in a forthcoming set determined the value of n. Each set was presented in its entirety before the subject was permitted to respond. The following time intervals, after the presentation of the last directive in a set, were allowed for the initiation of the subject's direction following behavior:

1) single directives ---------- 5 seconds;
2) two directive sets ---------- 10 seconds; and
3) five directive sets ---------- 25 seconds.

If a subject exceeded these limits he or she was asked to begin the performance of the directive(s) at that time.

Each performance of a directive was observed and recorded by the *IE* and the *AA*. The reinforcement schedule was as follows:

a) If one directive was given and the subject responded correctly, the subject was given one token.
b) If two directives were given, the subject had to follow both directives correctly to receive two tokens.
c) If three directives were given, the subject had to follow all three correctly to receive three tokens, otherwise, he received none.
d) When four or five directives were given, the subject had to perform at least three correctly to receive tokens. Each subject was given three, four, or five tokens according to the number of correct responses.

Responses to multiple directives were reinforced when the subject followed the directives in the designated sequence regardless of omissions. Tokens were exchanged for pennies at the end of each session at the rate of five tokens per penny.

Baseline

Five sets of stimulus sentence materials were administered to all subjects.

Training

The 27 subjects were randomly assigned to one of two training conditions: a) training rehearsal and placeholding; b) training control. Due to illness one

BEST COPY AVAILABLE

subject in the training control group was lost.

With the training rehearsal and placeholding group, two *E*'s were present and recorded data for the first two training sessions and at scheduled intervals thereafter. The *IE* was designated to interact with a subject during training and all subsequent phases of the program.

When the subject arrived, the *IE* greeted him. Then the *IE* set up the items of the appropriate training set on the bookshelves with the subject watching. The items were set up as shown in Appendix B. Similar items were placed together, one inside the other, where appropriate. The subject and the *IE* then went to their respective seats around the table. The bookcase, *NE*, *IE*, subject, and tokens were positioned as shown in Figure 1. Data sheets were placed in the laps of both *E*'s.

The *IE* then said,

> *Sometimes people have trouble remembering what other people tell them. But there are things you can learn to do to help you remember better. One way is to count the things you have to do, then you'll know how many things you have to remember. Another way to remember better is to repeat what I tell you to do, out loud. So every day when you come over here, we're going to practice counting and saying, out loud, what I tell you to do. Let* (NE) *and I show you what I want you to do.*

The demonstration was given as follows: the *IE* said,

> (NE), *Give me the penny.*
> *Show me the ashtray.*
> *Turn over the block.*

Immediately, the *NE* said,

> *One, give you the penny.*
> *Two, show you the ashtray.*
> *Three, turn over the block.*

The *NE* walked to the bookcase and performed as directed while verbalizing as above. The *IE* then said,

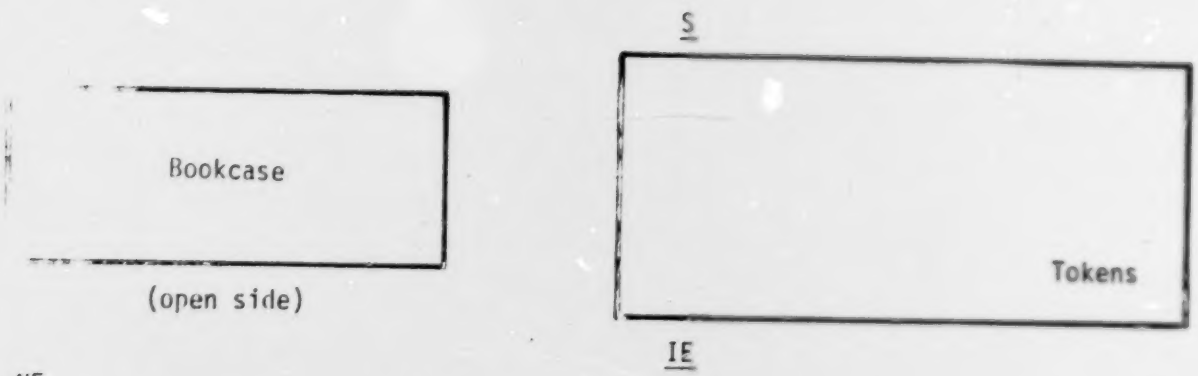
> *Every time you do just like* (NE) *did, you'll get tokens.* (The *IE* then held up the token.)

There was a maximum number of three tokens given for each directive in a set:

BEST COPY AVAILABLE

Figure 1

:itions of the Bookcase and the IE, NE, and S Tokens During Training



BEST COPY AVAILABLE

r rehearsing and counting correctly, one for correct motor response, and r correct sequence (given only when directive was followed correctly). It lained to the subject exactly why he received each token in the following

> *Here are three tokens for counting and saying everything right and here are six more for doing everything right. When we get all done today, we'll count how many tokens you have and you can exchange them for pennies. O.K., listen carefully and remember to count and say it all back to me.*

After a brief pause, the *IE* gave the following example:

> *Give me the penny.*
> *Show me the ashtray.*
> *Turn over the block.*

The *IE* then waited for a complete rehearsal, prompting if necessary, and watched the sudent do the task. If the subject omitted repeating or counting, the desired behavior was again modeled by the *IE* and *NE* and the subject was given the example again. No matter what the result, the *IE* put the appropriate number of tokens in front of the subject and continued with the first item in Training Event.

Tokens were exchanged for pennies at the end of each session at the rate of ten tokens per penny. Each session lasted a maximum of 30 minutes. The training progressed until each subject had achieved the criterion of less than ten percent variation in performance across similar sets for three consecutive complete training sessions or had completed 15 training sessions. All subject's met or exceed the first criterion and were tested for 15 complete training sessions.

Two *IE*'s were present with the training control group and recorded data for the first two training sessions and at scheduled intervals thereafter. The *IE* who coordinated to interact with a subject during training and all subsequent phases of the program.

When the subject arrived, the *IE* greeted him and set up the items of the

BEST COPY AVAILABLE

...riate training set on the bookshelves with the subject watching. The items were set up as shown in Appendix B. Similar items were placed together, one inside the other, where appropriate, and boxes which contained items were opened so that the objects inside could be seen. The subject and *IE* then went to their respective seats ...and the table. The bookcase, *NE*, *IE*, subject, and tokens were positioned as shown in Figure 1. Data sheets were placed in the laps of both *E*'s.

The *IE* then said,

> *Sometimes people have trouble remembering what other people tell them. One way to remember better is to practice remembering things everyday. So when you come over here, we're going to practice remembering. I'll tell you to do some things, then you think about what you're going to do, then get up from your chair and do them.*

The *IE* then gave a three-part example and continued:

> *Everytime you remember what I told you to do and do it in the right order, you'll get tokens.*

The *IE* then held up a token and said,

> *When we get all done today, we'll count how many tokens you have and you can exchange them for pennies. O.K., listen carefully.*

After a brief pause, the *IE* gave the first set of directives. The appropriate number of tokens were placed on the table in front of the subject and he was told exactly why he received them. There was a maximum of three tokens given for each directive: two for correctness and one for exact sequence. The tokens were exchanged for pennies at the end of each session at the rate of ten tokens per penny.

Each session lasted a maximum of 30 minutes. The training progressed until each subject had achieved the criterion of less than ten percent variation in performance across similar sets for three consecutive complete training sessions, or had completed 15 training sessions. All subject's failed to meet the first criterion and were tested for 15 complete training sessions.

Posttest

The posttest was a replication of the pretest in procedure and use of stimulus

BEST COPY AVAILABLE

ls. It was administered to the subjects the day following completion of training.

Results and Discussion

The data were analyzed from training and generalization performance in terms of the number of directives correctly followed and the number of directives correctly sequenced by the experimental (placeholding and rehearsal) and control (practice) groups. Since each subject was presented more than one set of directives containing the same number of separate directives in each session, the average performance of each subject on a particular set for each session was considered a single data point for convenience in recording data for both correctness and sequence. The performance data for seven subjects from eight sessions were randomly selected to assess interobserver reliability. The number of agreements divided by the total exceeded 0.90 in all eight instances.

Correctness

A 2 x 2 x 5 (groups x conditions x sets) analysis of variance revealed a statistically significant set difference within subjects ($F(4,88) = 133.43$, $p < .001$) as well as a significant pretest and posttest difference within subjects ($F(1,22) = 5.99$, $p < .025$). The significant difference in performance within subjects and across sets reflects the varying degree of difficulty between directive sets. The significant pretest and posttest differences within subjects indicate how practice and rehearsal strategies facilitate performance.

Generalization was also assessed with a 2 x 2 x 5 (groups x conditions x sets) analysis of variance. This analysis resulted in a significant set difference within subjects ($F(4,88) = 112.98$, $p < .001$) and a significant pretest and posttest difference within subjects ($F(1,22) = 7.55$, $p < .025$). Since the generalization performance data so closely resembles the correctness performance data, it is questionable whether these two measures reflect different dependent variables and, once

BEST COPY AVAILABLE

both practice and rehearsal strategies seem to facilitate performance.

In addition a *post hoc* analysis was performed on the training and generalization data from experimental (high IQ and low IQ) and control (high IQ and low IQ) groups in an attempt to bring to light more meaningful implications of the correctness data. The results of this analysis are presented in Table 1. Once again there is a distinct similarity between the results of the training performance and the generalization performance data. Both indicate that practice with the high IQ group and rehearsal with the low IQ group facilitate performance. Significant differences were found on training performance with the high IQ practice group and on generalization performance with the high IQ practice group and the low IQ rehearsal group. These results suggest that the artificially imposed strategy of rehearsal could have interferred with the high IQ group who presumably were attempting to implement strategies of their own. Conversely, the low IQ group, seemingly lacking in a strategy, utilized rehearsal and were able to benefit from it.

The final analysis of the correctness data involved the serial position of directives correctly followed in sets of two, three, four, and five. The percentages of directives correctly followed are for the various sets presented in Figure 2. Figure 2 illustrates the similarity of serial position effects between the groups and within the two groups before and after training. Strong primacy and recency effects can also be noted. While an extremely strong recency effect can be seen for all groups performing on sets with four directives, a comparable primacy and recency effect can be noted for all groups performing on sets with five directives. It is unclear as to why these two curves should vary so markedly. It can be hypothesized, however, that with increasing levels of difficulty recency effects are gradually replaced by primacy effects.

Sequence

The sequence in which directives were appropriately followed was scored in terms of an index reflecting the extent of deviation from the proper sequence of

BEST COPY AVAILABLE

Table 1

Pretest to Posttest Change in Generalization Performance

CATEGORIES	TOTAL N PER GROUP	IMPROVED	WORSE	NO CHANGE	CRITICAL VALUE*
REHEARSAL HIGH IQ	7	4	3	0	.500
PRACTICE HIGH IQ	6	6	0	0	.016
REHEARSAL LOW IQ	7	7	0	0	.008
PRACTICE LOW IQ	6	2	4	0	.344

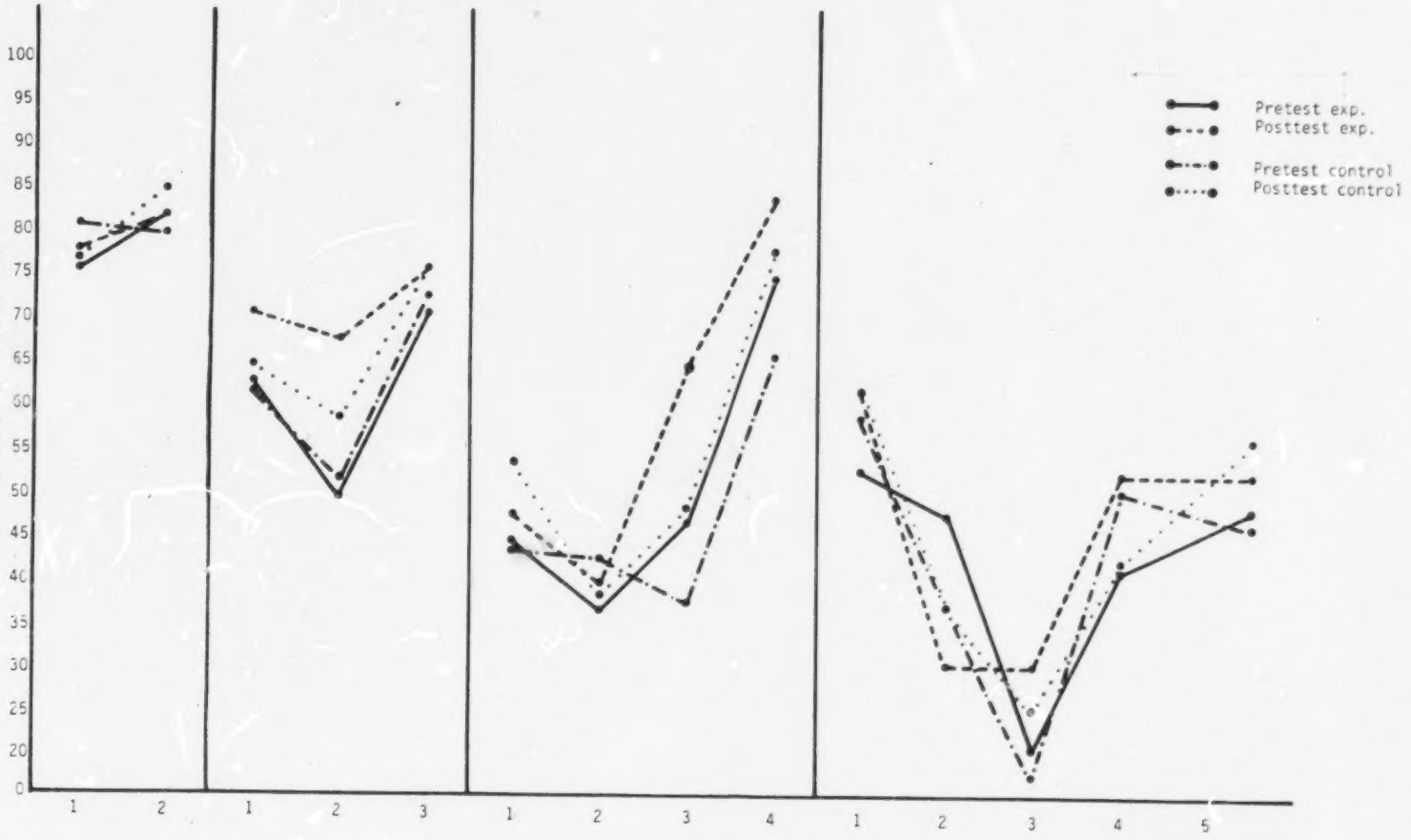
Pretest to Posttest Change in Training Performance

CATEGORIES	TOTAL N PER GROUP	IMPROVED	WORSE	NO CHANGE	CRITICAL VALUE*
REHEARSAL HIGH IQ	7	3	3	1	.656
PRACTICE HIGH IQ	6	6	0	0	.016
REHEARSAL LOW IQ	7	6	1	0	.062
PRACTICE LOW IQ	6	2	4	0	.344

*Using Sign Test for the Significance of Change. Siegel, S. *Nonparametric Statistics*. New York: McGraw-Hill, 1956, pp. 68-75.

BEST COPY AVAILABLE

Figure 2 Serial Position Curve



BEST COPY AVAILABLE

...tives within a set. A score was recorded for every appropriately performed directive only if it was preceded by another directive which properly belonged earlier in the sequence. For example, a three-directive set properly sequenced in the order 1, 2, 3 was scored 2 + 1 = 3 indicating that two directives (2 and 3) properly occurred later in the sequence than Directive 1, and that one directive (3) properly occurred later in the sequence than Directive 2. Similarly, a five-directive set sequenced in the proper order (1, 2, 3, 4, 5) was scored 4 + 3 + 2 + 1 = 10 reflecting the fact that four directives (2, 3, 4, 5) occurred properly sequenced later than Directive 1, three directives occurred after Directive 2, etc. An improperly sequenced set of directives, such as a four-directive set performed in the order 4, 2, 3, 1 was scored 0 + 1 + 0 = 1 indicating that only Directive 3 followed a directive which occurred earlier in the proper sequence. Omissions and incorrectly followed directives occurred quite frequently in the performance of both groups and were not scored. For example, a three-directive set performed in the order 1, 2, 3 received the same score (2 + 1 = 3) as a four-directive set performed in the order 1, 2, 4 although Directive 3 was omitted in the latter set.

A 2 x 2 x 4 (groups x conditions x sets) analysis of variance revealed a significant pretest and posttest difference within subjects ($F(1,22) = 4.94$, $p < .05$). Apparently, both practice and rehearsal strategies facilitate sequence performance.

Generalization was also assessed with a 2 x 2 x 4 (groups x conditions x sets) analysis of variance. This analysis reflected a significant pretest and posttest difference within subjects ($F(1,22) = 9.68$, $p < .01$). The similarity of results between training performance and generalization performance suggests once again, that in effect, what was once considered to be two measures on two dependent variables has resulted in the possibility of two measures on one dependent variable. A *post hoc* analysis of the sequence data performed by dividing each group into

BEST COPY AVAILABLE

Table 2

Pretest to Posttest Change in Generalization Sequence

CATEGORIES	TOTAL N PER GROUP	IMPROVED	WORSE	NO CHANGE	CRITICAL VALUE*
[illegible] IQ	7	4	3	0	.500
PRACTICE HIGH IQ	6	6	0	0	.016
REHEARSAL LOW IQ	7	2	3	2	.500
PRACTICE LOW IQ	6	2	3	1	.500

Pretest to Posttest Change in Training Sequence

CATEGORIES	TOTAL N PER GROUP	IMPROVED	WORSE	NO CHANGE	CRITICAL VALUE*
[illegible]	7	4	3	0	.500
[illegible]	6	5	1	0	.109
[illegible]	7	4	2	1	.344
[illegible]	6	3	3	0	.344

[illegible] for the Significance of Change. Siegel, S. Nonparametric Statistics. New York: McGraw-Hill, 1956, pp. 68-75.

BEST COPY AVAILABLE

of high and low IQ resulted in a significant pretest and posttest difference in the high IQ practice group on generalization performance. The results of this analysis are presented in Table 2.

moderately retarded apparently profit from intervention in their direction of performance. The results of this study did not confirm the expectation that strategy of placeholding and overt rehearsal would facilitate performance. [illegible] 1972) stated that memory is negatively influenced by processing deficits of the retarded and that a training procedure must be tailored to the retardates existing mode of information processing. Similarly, the results of this investigation suggest that both practice and rehearsal differentially influence performance. It seems questionable that consideration of a single rehearsal strategy alone can facilitate performance in retarded individuals with varying intelligence (IQ) and modes of processing information.

If the processes underlying direction following are comparable to those related to memory, then several components pertaining to performance must be considered. Butterfield, Wambold, and Belmont (1972) mention that active rehearsal along with sequencing active and passive rehearsal strategies and appropriate retrieval strategies are all critical to performance. A better understanding of these factors could permit the recognition of more appropriate rehearsal strategies.

BEST COPY AVAILABLE

References

Belmont, J. M. Relations of age and intelligence to short-term color memory. *Child Development*, 1972, in press.

Belmont, J. M. & Butterfield, E. C The relations of short-term memory to development and intelligence. In L. C. Lipsitt & H. W. Reese (Eds.) *Advances in Child Development and Behavior*. New York: Academic Press, 1969, 4, 28-82.

Belmont, J. M. & Butterfield, E. C. Acquisition strategies as determinants of memory deficiencies. *Cognitive Psychology*, 1971, 2, 411-420(a).

Belmont, J. M. & Butterfield, E. C. What the development of short-term memory is. *Human Development*, 1971, 14, 236-248(b).

Butterfield, E. C., Wambold, C., & Belmont, J. M. On the theory and practice of improving short-term memory in the retarded. Unpublished manuscript, Kansas University, 1972.

Ellis, N. R. Memory processes in retardates and normals. In N. R. Ellis (Ed.), *International Review of Research in Mental Retardation*. New York: Academic Press, 1970, 4, 1-32.

Glass, G. Temporal aspects of information storage. Unpublished manuscript, Kansas University, 1972.

Lent, J. R., Holvoet, J. F., Ferneti, C. L., Keilitz, I., & Tucker, D. J. Direction following of retarded and nonretarded adolescents: Parsons Research Center Working Paper No. 280, Parsons, Kansas, May 1972.

Ogden, D. P. WISC I.Q.'s for the mentally retarded. *Journal of Consulting Psychology*, 1960, 24, 187-190.

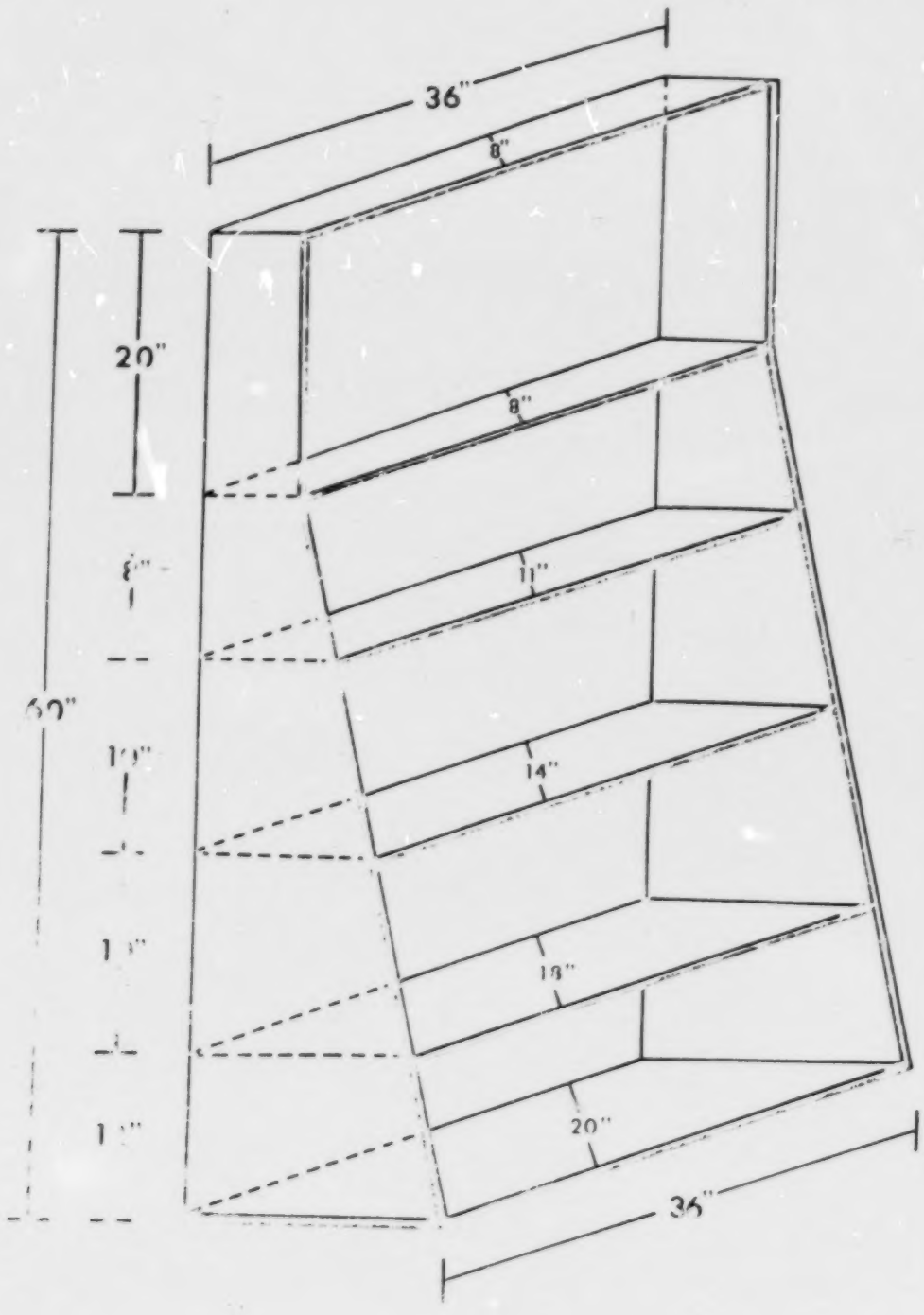
Sokolove, H. and Girardeau, F. What are the most important language and communication skills to teach developmentally disabled children. Unpublished manuscript, Kansas University, 1972.

Waugh, N. C. and Norman, D. A. Primary memory. *Psychological Review*, 1965, 72, 89-104.

APPENDIX A

BEST COPY AVAILABLE

Bookshelf for Stimulus Objects

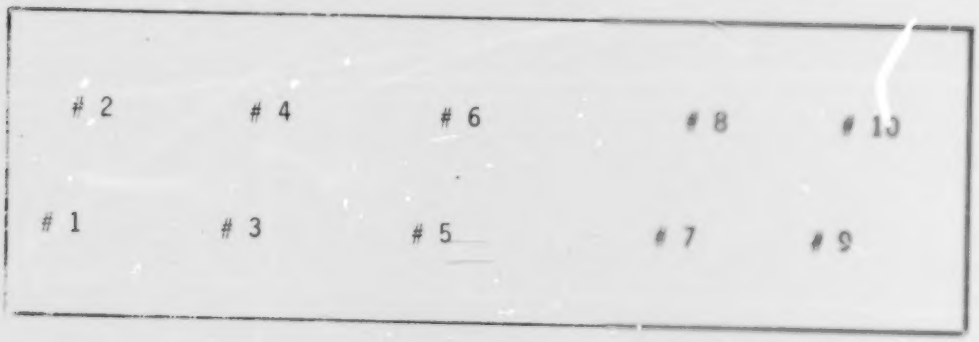


APPENDIX B

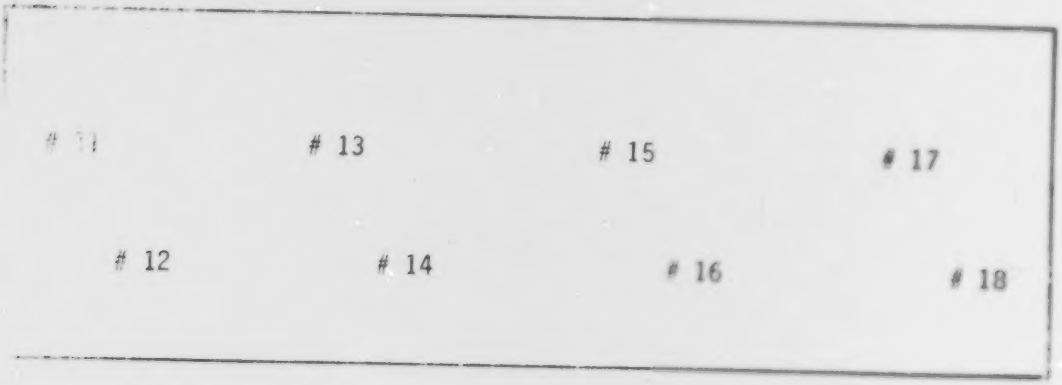
BEST COPY AVAILABLE

Numbered Locations of Arrangement of Objects on Shelves

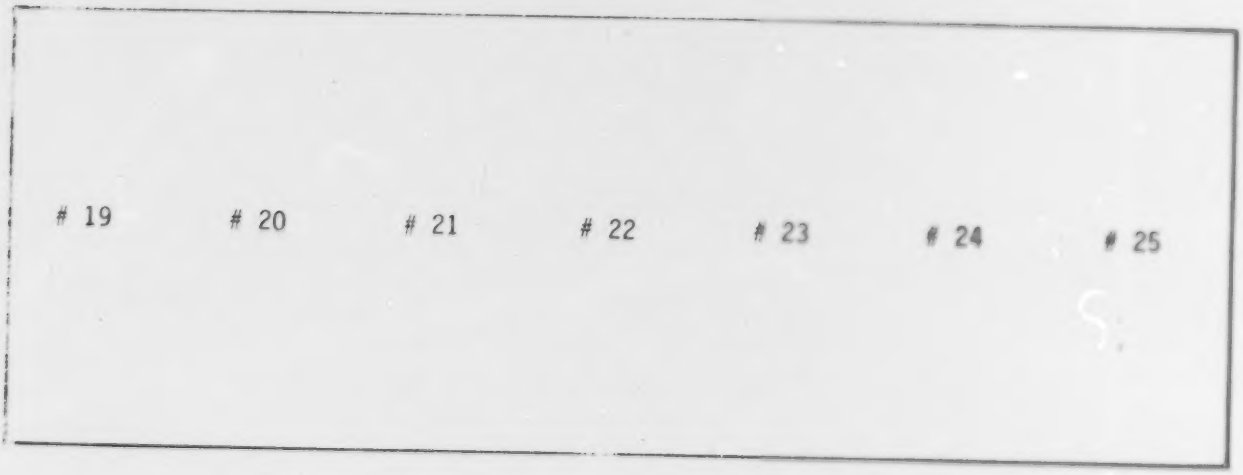
Second Shelf



Third Shelf



Fourth Shelf



BEST COPY AVAILABLE

Second Shelf

Generalization Set	Set 1	Set 2	Set 3	Set 4	Set 5
1. 2 cows (black, white)	basket	bird	3 elephants (big, med., little)	2 watches (big, little)	3 balloons (1 big, 2 little)
2. 2 cups (big, little)	penny	thimble	2 mirrors (pink, yellow)	2 angels (pink, white)	2 chalks (big, little)
3. 2 spoons	lighter	ring	crown	2 rollers (pink, green)	2 paperclips
4. grapes	3 buttons (big, med., little) (pink, white, red)	padlock	hairbrush	3 spools	truck
5. 2 keys	2 horses (big, little)	3 rabbits (1 big, 2 little)	zipper	hot dog	2 jacks
6. 2 balls (big, little)	3 marbles (1 big, 2 little) (2 green, 1 yellow)	dice (1 die)	shoe	glasses (eye)	frog
7. safety pin	tiger	boy	flashlight	2 spiders	knife
8. 2 plates (big, little)	5 airplanes (red, green, blue, white, yellow)	pig	lightbulb	2 hats (white, yellow)	matches
9. pocket knife	2 dogs	3 boots (green, yellow, white)	2 leaves	girl	soap
10. 2 toothbrushes (pink, blue)	3 rubber bands	lipstick	3 ribbons (pink, white, yellow)	2 butterflies (pink, yellow)	2 flowers (yellow, pink)

BEST COPY AVAILABLE

Third Shelf

Generalization Set	Set 1	Set 2	Set 3	Set 4	Set 5
11. cards	iron	perfume	2 flags (big, little)	pliers	sponge
12. indian	chain	house	coat	chicken	glass (drinking)
13. crayons	fork	boat	salt shaker	tractor	tape
14. stamp	pen	top	saw	carrot	clothespin
15. ruler	shoestring	eggbeater	washrag	2 envelopes	bib
16. 3 cars (black, green, blue)	scissors	scissors	scissors	scissors	scissors
17. bracelet	worm	screwdriver	thread	2 sheep (1 white)	pipe
18. pencil	kleenex	hammer	2 bandaids	cowboy	eraser

BEST COPY AVAILABLE

Fourth Shelf

Generalization Set	Set 1	Set 2	Set 3	Set 4	Set 5
19. 2 pans (big, little)	coloring book	tablet	corn	purse	3 socks (pink, yellow, white)
20. magazine	ashtray	gun	record	belt	construction paper
21. fly swatter	dishrag	towel	banana	tool box	candle
22. book	block	3 combs (yellow, pink, white)	3 sacks	pear	paintbrush
23. toothbrush	pencil	pencil	pencil	pencil	pencil
24. handkerchief	paper	orange	toilet paper	tomato	2 gloves (1 white)
25. paper	door	apple	fan	axe	newspaper

APPENDIX C

List of Verbs, Prepositions, and Adjectives
Used to Generate Experimental Sentences

Verbs	Prepositions	Adjectives
1. give	1. next to	1. green
2. hand	2. in	2. two
3. go get	3. under	3. big
4. draw	4. beside	4. blue
5. fold	5. in front of	5. some
6. bring	6. behind	6. yellow
7. [illegible]	7. above	7. large
8. [illegible]	8. beneath	8. one
9. [illegible]	9. over	9. little
10. [illegible]	10. on	10. small
11. [illegible]	11. inside	11. all
12. [illegible]		12. white
13. [illegible]		13. pink
14. [illegible]		14. black

BEST COPY AVAILABLE

List of Nouns Used to Generate Experimental Sentences

1. cow
2. cup
3. spoon
4. grapes
5. key
6. ball
7. safety pin
8. plate
9. pocketknife
10. toothbrush
11. cards
12. Indian
13. crayons
14. stamp
15. [illegible]
16. [illegible]
17. bracelet
18. pencil
19. [illegible]
20. [illegible]
21. [illegible]
22. [illegible]
23. [illegible]
24. [illegible]
25. [illegible]
26. [illegible]
27. [illegible]
28. [illegible]
29. [illegible]
30. [illegible]
31. [illegible]
32. [illegible]
33. [illegible]
34. [illegible]
35. [illegible]
36. [illegible]
37. [illegible]
38. [illegible]
39. [illegible]
40. [illegible]
41. chain
42. fork
43. pen
44. shoestring
45. scissors
46. worm
47. kleenex
48. coloring book
49. ashtray
50. dishrag
51. block
52. door
53. ear
54. chair
55. bird
56. thimble
57. ring
58. padlock
59. rabbit
60. dice
61. toy
62. [illegible]
63. boat
64. lipstick
65. perfume
66. house
67. boat
68. [illegible]
69. eggbeater
70. screwdriver
71. hammer
72. tablet
73. gun
74. towel
75. comb
76. orange
77. apple
78. eye
79. ceiling
80. elephant
81. mirror
82. crown
83. hairbrush
84. zipper
85. shoe
86. flashlight
87. lightbulb
88. leaves
89. ribbon
90. flag
91. coat
92. salt shaker
93. saw
94. washrag
95. thread
96. bandaid
97. corn
98. record
99. banana
100. sack
101. toilet paper
102. fan
103. mouth
104. floor
105. pliers
106. chicken
107. tractor
108. carrot
109. envelope
110. sheep
111. cowboy
112. purse
113. belt
114. tool box
115. pear
116. tomato
117. axe
118. wall
119. nose
120. balloon
121. chalk
122. paperclips
123. truck
124. jacks
125. frog
126. knife
127. matches
128. soap
129. flower
130. sponge
131. glass (drinking)
132. tape
133. clothespin
134. bib
135. pipe
136. eraser
137. sock
138. construction paper
139. candle
140. paintbrush
141. glove
142. newspaper
143. hair
144. doorknob
145. watch
146. angel
147. roller (hair)
148. spool
149. hot dog
150. glasses (eye)
151. spider
152. hat
153. girl
154. butterfly

BEST COPY AVAILABLE